INDOOR AIR QUALITY ASSESSMENT

Old Rochester Regional High School
135 Marion Road
Mattapoisett, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health Assessment
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Background/Introduction

At the request of William R. Cooper, Superintendent**,** Old Rochester Regional School District, the Bureau of Environmental Health Assessment (BEHA) of the Massachusetts Department of Public Health (MDPH) provided assistance and consultation regarding mold growth in building components moistened due to excessive humidity during August 2003 at the Old Rochester Regional High School (ORRHS), 135 Marion Road, Mattapoisett, Massachusetts. At the time of the assessment, the building was unoccupied and under renovation. On August 22, 2003, a visit to conduct an indoor air quality assessment was made to this school by Michael Feeney, Director of the Emergency Response/Indoor Air Quality (ER/IAQ) program, BEHA.

The ORRHS is a multi-wing structure constructed in 1966. BEHA staff previously visited the building to investigate sewer gas odors (MDPH, 2001). The building has undergone a complete renovation since that time, including the current construction of new classroom wings. Prior to the most recent BEHA assessment, the school department hired a consultant, Engineering & Fire Investigation (EFI), to characterize water damage and the extent of mold growth within this building.

Methods

Visual observation of building components for mold and water damage was conducted. Surface temperature of building and heating, ventilating and air-conditioning (HVAC) system components was measured with a Thermotrace Infrared Thermometer, Model No. 15005. Air tests for temperature and relative humidity were taken with the TSI, Q-Trak, IAQ Monitor, Model 8551. Test results are shown in Table 1.

Results/Discussion

The building was evaluated on a relatively warm day, with an outdoor temperature of 83^{o}F and relative humidity of 60 percent. The last recorded rainfall in the Mattapoisett area occurred August 17, 2003 (Weather Underground, 2003), five days prior to this assessment. Of note were the remediation efforts that were in place at the time of the assessment. The general contractor had removed water damaged carpeting, ceiling tiles and mold colonized chilled water pipe insulation.

No standing water or condensation droplets were found in any of the areas examined. Several areas had relative humidity at or above 70 percent (Table 1). According to the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), if an indoor relative humidity exceeds 70 percent (ASHRAE, 1989), mold growth may occur in materials that are susceptible to colonization. Therefore, building components such as carpeting, gypsum wallboard, ceiling tiles and pipe insulation can become sufficiently moistened if exposed to water vapor for an extended period of time.

Condensation is the most likely source of moisture that led to mold colonization in pipe insulation (Pictures 1 through 3) and carpeting. BEHA staff noted a musty odor in the band room that was attributed to moistened carpeting. It is possible that these materials were subjected to condensation for an extended period of time. Condensation is the collection of moisture on a surface at or below the dew point. The dew point is the temperature that air must reach for saturation to occur. At a temperature of 83^{o} F and relative humidity of 60 percent, the dew point necessary for water to collect on a surface

is 68 ^{o} F. Surface temperatures measured in most areas with active, chilled air ventilation were equal to or below the dew point on August 22, 2003. Any surface inside the ORRHS that had a temperature at or below 68 ^{o} F would generate condensation. Surface temperatures of floors measured in a number of areas throughout the ORRHS ranged between 61 ^{o} F to 66 ^{o} F (Table 1), which were below the outdoor dew point. If measures were not taken to dry carpeting using heating fans, it is likely that carpets remained moist for an extended period of time. The US Environmental Protection Agency and the American Conference of Governmental Industrial Hygienists (ACGIH) recommends that porous materials be dried with fans and heating within 24-48 hours of becoming wet (US EPA, 2001; ACGIH, 1989). If porous materials are not dried within this time frame, mold growth may occur. Water-damaged porous materials cannot be adequately cleaned to remove mold growth. The application of a mildewcide to moldy porous materials is not recommended.

Conclusions/Recommendations

In view of the findings at the time of the inspection, the following recommendations are made:

1. Continue with plans to remove mold-colonized materials, such as pipe insulation, ceiling tiles, and gypsum wallboard.
2. Remediate mold contaminated building materials in a manner consistent with *Mold Remediation in Schools and Commercial Buildings* published by the US Environmental Protection Agency (US EPA) (US EPA, 2001). Copies of this

document can be downloaded from the US EPA website at:

http://www.epa.gov/iaq/molds/mold_remediation.html

3. Operate the HVAC system in a manner to prevent condensation on floors and other building components. Monitor the temperature and relative humidity during hot and humid weather to keep building components temperatures above the dew point and remove water vapor from the building interior.
4. Cleaning was indicated as an option for removal of odor from the band room carpet. Although cleaning may temporarily remove microbial growth from the carpet, further growth can be expected to occur if the temperature of the floor drops below the dew point for extended periods of time, which will remoisten the carpeting. To avoid this occurrence, remove carpeting from the band room. If visible mold and/or moisture are present below the carpet, clean with an appropriate microbiological agent. Consider replacing the band room carpets with an alternative sound attenuating floor tile.
5. Consider consulting a building engineer to determine the extent of the effect of water damage to chilled water pipe and univent insulation. Remediate as needed.

References

ACGIH. 1989. Guidelines for the Assessment of Bioaerosols in the Indoor Environment. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

ASHRAE. 1989. ASHRAE Standard Ventilation for Acceptable Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA. ANSI/ASHRAE 62-1989 Sec. 5.12.

MDPH. 2001. Letter to Elizabeth A. Quinn, Superintendent from Suzanne Condon, Assistant Commissioner, Bureau of Environmental Health Assessment concerning Sewer Gas Odors at Old Rochester Regional High School, Mattapoisett, Massachusetts, Dated May 31, 2001. Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Boston, MA.

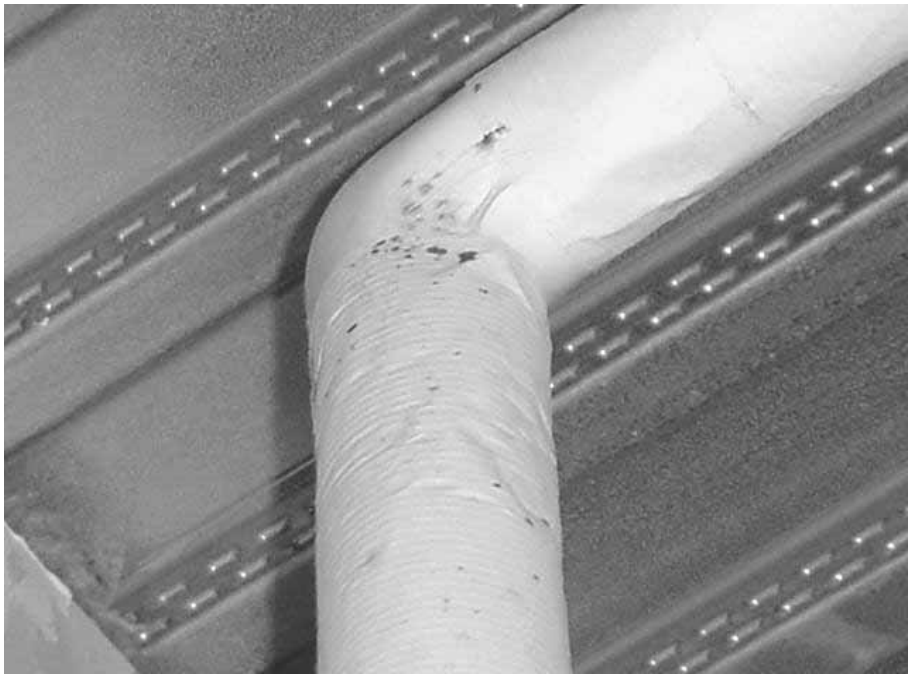
The Weather Underground. 2003. Weather History for New Bedford, Massachusetts, August 22, 2003.
http://www.wunderground.com/history/airport/KEWB/2003/8/22/DailyHistory.html

US EPA. 2001. *Mold Remediation in Schools and Commercial Buildings*. Office of Air and Radiation, Indoor Environments Division, Washington, DC. EPA 402-K-01-001. March 2001.

Picture 1

Pipe Hanger for Chilled Water Pipe, Note Rust from Exposure to Water

Picture 2



Mold Colonized Pipe Insulation

Picture 3

Mold Colonized Pipe Insulation

TABLE 1

Indoor Air and Temperature Test Results*
Mattapoisett, Old Rochester High School
August 22, 2003

Location	Temp (°F)	Relative Humidity (%)	Surface Temp gypsum wall board (°F)	Comments
Outdoors	83	60	-	
1720	79	55	-	
Band room	79	66	66	wet carpet, musty odor
Library	75	70	61	
1935	75	67	61	
1021	76	68	63	
0319	73	70	66	Mold colonized pipe insulation in Pictures 2 and 3
0424	74	78	61	

Note: Dew point on this date was: 68° F